

REMARKS

Claims 1-41 are pending in this application. All claims have been rejected under 35 U.S.C. § 103. Claim 1 has been amended to specify that the plasma comprises both a silanol capping agent and a reducing or oxidizing agent. Claims 2, 12, 14 and 24 have been amended to reflect the amendment to claim 1.

Claim 25 has been amended to recite that the capping and removal operations are performed in different stations of a multi-station chamber. Support for this amendment appears on page 5, lines 6-10.

No new matter has been added.

35 U.S.C. § 103 Rejections

Claims 1-41 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of US Published Application No. US 2004/0096672 to Lukas et al. ("Lukas") and Cho et al. "Plasma Treatments of Molecularly Tempered Nanoporous Silica Films," ("Cho") which was cited by Applicants in an Information Disclosure Statement. Applicants respectfully traverse this rejection.

Claims 1-24

In the Advisory Action, the Examiner states that the claims are unpatentable because "Lukas inherently teaches the existence of silanols in the reaction sequence in the plasma but is silent on the purpose of the silanol."

Applicants dispute this contention and request that the Examiner point the specific section of Lukas and/or provide reasoning as to why it is believed that the pore-forming plasma of Lukas would contain a silanol. Applicants also request that the Examiner explain the mechanism by which the pore-forming plasma of Lukas would protect the matrix with hydrophobic groups. There is no teaching or suggestion or reason to believe that the pore-forming plasma of Lukas would contain a silanol or that this plasma would protect hydrophobic groups.

Indeed the only place where Applicants found mention of a silicon-containing compound in Lukas was in formation of the multiphasic film (paragraphs 0029 – 0033). There is no teaching or suggestion in that any plasma used in the subsequent pore-forming step would (inherently or explicitly) include a silanol or that it would protect the matrix with hydrophobic

groups. Rather the plasma removal in Lukas appears to be a conventional plasma-based porogen removal process that creates "dangling bonds" (unsaturated SiO- or Si- groups) within the silicon-based dielectric matrix.

Applicants maintain that at least because none of the cited references teach or suggest either 1) exposing a precursor layer containing a porogen and a matrix to a plasma comprising a silanol capping agent, or 2) concurrently removing the porogen and protecting the matrix with hydrophobic groups, the claims are patentable.

In addition, Applicants have amended claim 1 to specify that the precursor layer is exposed to a plasma containing both a silanol capping agent (i.e., to protect the matrix with hydrophobic groups) and a reducing or oxidizing agent (i.e., to remove the precursor from the matrix). This feature allows the removal and capping operations to be performed concurrently and is not taught or suggested by the cited art.

Claims 25-41

Claim 25 recites "after removing said organic porogen, exposing the dielectric matrix to a silanol agent, without first exposing the dielectric matrix to moisture or ambient conditions."

Applicants note that the Examiner has not identified the recited claims features in either of the prior references. If the rejection is based upon inherent disclosure of the recited claim features or upon some feature allegedly understood by those of skill in the art but not explicitly disclosed in the text of the reference, Applicants respectfully request that the Examiner make this clear and point to the source of the pertinent claim features in the Lukas and/or Cho.

In addition, Applicants have amended claim 25 to specify that the silanol capping and porogen removal agents occur in different stations of a multi-station tool. This feature facilitates preventing exposure of the matrix to a moisture or ambient conditions after porogen removal and before exposure to a silanol capping agent. As explained in the specification, Applicants recognized the problems encountered in previously known processes, where care was not taken to prevent exposure of the dielectric matrix to moisture or ambient conditions after porogen removal and before exposure to a silanol capping agent. See e.g., page 3, lines 14-18 and page 15, lines 15-23.

In addition to being patentable for the reasons given above with respect to claim 25, dependent claims 26-41 contain features that are independently patentable. For example, claim 32 specifies that the silanol capping agent is provided in a second plasma. Neither Lukas nor Cho teach or suggest providing a silanol capping agent in a plasma.

Withdrawal of the 35 U.S.C. § 103(a) rejections of claims 1-41 is respectfully requested.

Conclusion

Applicants believe that all pending claims are allowable and respectfully request a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

Respectfully submitted,
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